PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.: 10/536,781	Examiner: Philip Earl Stimpert
Applicant/Appellant: Nigel Paul Schofield	Art Unit: 3746
Title: VACUUM PUMPING ARRANGEMENT	Confirmation No.: 4221
Filed: October 11, 2005	
Atty. Docket No.: M02B162	

Commissioner for Patents
MAIL STOP ****APPEAL BRIEF - PATENTS****
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Dear Sir/Madam:

Appellant submits herewith an Appeal Brief in the above-referenced matter under 37 CFR 41.37.

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I. STATEMENT OF THE REAL PARTY IN INTEREST

The real party in interest is Edwards Limited, an English company of Manor Royal Crawley, West Sussex, RH10 9LW, United Kingdom, and is the assignee of record of the subject application.

II. RELATED APPEALS AND INTERFERENCES

Appellant is not aware of any related appeals, judicial proceedings or interferences that may be related to, directly affect, be directly affected by, or have a bearing on the Board's decision on this appeal.

III. STATUS OF CLAIMS

Claims 1, 3-5, 7-11, 16, 18 and 19 are pending in the application. Claims 2, 6, 12-15, and 17 are cancelled. Claims 1, 3-5, 7-11, 16, 18 and 19 stand rejected by the Examiner, and are the claims on appeal.

IV. STATUS OF AMENDMENTS

No amendment has been filed subsequent to the Final Office Action dated March 18, 2010.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The invention is directed to a vacuum pumping arrangement constructed by multiple pumping mechanisms. With reference to FIG. 1 of the present application, one exemplar vacuum pumping arrangement includes a turbomolecular pumping mechanism

12, molecular drag pumping mechanisms 18 and 20, and a backing pumping mechanism 14. At least one rotor blade 58 of the turbomolecular pumping mechanism 12 extends radially outwardly from rotor body 52. The at least one rotor blade 58 of the turbomolecular pumping mechanism 12 is provided with an annular ring 60, disposed co-axially with the rotor body 52 and positioned between two ends of the at least one rotor blade 58 in a radial direction. A cylindrical rotor 62 of the molecular drag pumping mechanism 18 is attached to the annular ring 60. As the at least one rotor blade 58 rotates, it drives the cylindrical rotor 62 to draw gas from the turbomolecular pumping mechanism 12 into the molecular drag pumping mechanism 18.

The use of the rotor blade 58 and annular ring 60 to support the cylindrical rotor 62 of the molecular drag pumping mechanism 18 avoids the need for a separate connection plate as typically required in the prior art. Therefore, the disclosed vacuum pumping arrangement can be made more compact than in the prior art. Moreover, the elimination of the conventional connection plate reduces the flow impedance between the turbomolecular pumping mechanism 12 and the molecular drag pumping mechanism 18, thereby improving the pumping performance.

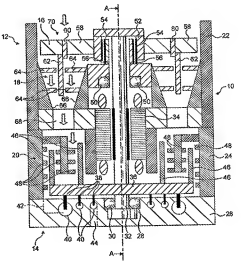

FIG. 1

Independent claim 1 is directed to a vacuum pumping arrangement comprising: a turbomolecular pumping mechanism *(e.g., FIG. 1, number 12)* having a rotor, wherein the rotor comprises a rotor body *(e.g., FIG. 1,*

number 52) and rotor blades *(e.g., FIG. 1, number 58)* extending radially outwards from the rotor body *(e.g., page 6, lines 8-9)*; and a molecular drag pumping mechanism *(e.g., FIG. 1, number 18)* connected in series with the turbomolecular pumping mechanism *(e.g., FIG. 1, number 12)*, wherein a rotor *(e.g., FIG. 1, number 62)* of the molecular drag pumping mechanism *(e.g., FIG. 1, number 18)* is affixed to the rotor blades *(e.g., FIG. 1, number 58)* of the turbomolecular pumping mechanism *(e.g., FIG. 1, number 12)*; and wherein the rotor blades *(e.g., FIG. 1, number 58)* of the turbomolecular pumping mechanism *(e.g., FIG. 1, number 12)* are provided with an annular ring *(e.g., FIG. 1, number 60),* disposed co-axially with the rotor body and positioned between two ends of each of the rotor blades *(e.g., FIG. 1, number 58)* in a radial direction, to which the rotor *(e.g., FIG. 1, number 62)* of the molecular drag pumping mechanism *(e.g., FIG. 1, number 18)* is fixed *(e.g., page 6, lines 9-19).*

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Whether Examiner errs in rejecting claims 1, 3-5, 7, 8, and 16 under 102(b) as being anticipated by US Patent No. 5,893,702 to Conrad et al. (hereinafter referred to as "Conrad").

B. Whether Examiner errs in rejecting claims 1, 3-5, 7, 8 and 16 under 35 USC 103(a) as being obvious over Conrad.

C. Whether Examiner errs in rejecting claims 9, 18, and 19 under 35 USC 103(a) as being unpatentable over Conrad in view of US Patent No. 6,135,709 to Stones (hereinafter referred to as "Stones").

D. Whether Examiner errs in rejecting claim 10 under 35 USC 103(a) as being unpatentable over Conrad in view of US Patent No. 4,465,434 to Rourk (hereinafter referred to as "Rourk").

E. Whether Examiner errs in rejecting claim 11 under 35 USC 103(a) as being unpatentable over Conrad in view of US Patent No. 5,230,924, which Appellant believes was misplaced for No. 5,848,873, to Schofield (hereinafter referred to as "Schofield").

VII. ARGUMENT

A. Examiner errs in rejecting claims 1, 3-5, 7, 8, and 16 under 102(b) as being anticipated by Conrad.

1. Conrad teaches a friction pump having a plurality of parallel discharge channels for improving the suction capacity compared to a conventional, single-channel friction pump.

With reference to FIG. 1, Conrad teaches a friction pump having a rotor formed by a plurality of coaxial cylindrical elements 5 surrounded by a stator formed by a plurality of coaxial cylindrical elements 6. *See, col. 4, lines 2-4.* Between the coaxial cylindrical elements 5 and 6 are a plurality of parallel discharge channels 7 serving as pumping chambers for pumping gas from a suction port 2 to a discharge port 3. *See, col. 4, lines 6-11.* The parallel arrangement of the

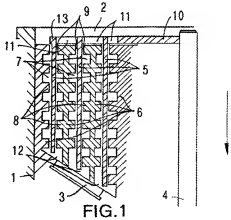

FIG.1

discharge chambers increases the suction capacity of a gas friction pump several times in comparison with the suction capacity of conventional gas friction pumps. *See, col. 2, lines 51-57.*

The coaxial cylindrical elements 5 are connected to shaft 4 via a connection element 10. *See, col. 3, lines 61-67.* One exemplary connection element is formed by vanes 14 extending at an angle to the suction port 2, as illustrated in FIG. 3. *See, col. 4, lines 23-26.* The connection element 10 is provided with openings 11, thereby facilitating or enhancing gas flow into the discharge channels 7 from the suction port 2. *See, col. 4, lines 19-23.*

2. *Conrad fails to teach the limitation "the rotor blades of the turbomolecular pumping mechanism are provided with an annular ring, disposed co-axially with the rotor body and positioned between two ends of each of the rotor blades in a radial direction" of claim 1.*

Examiner equates Conrad's connection element 10 illustrated in FIG. 3 to the claimed rotor blades of the turbomolecular pumping mechanism. *See, the Final Office Action, paragraph 5.* However, Appellant respectfully disagrees.

As shown in FIG. 6 of Conrad, the connection element 10 is part of a gas friction pump at the middle section of a compound vacuum pump, instead of a turbomolecular pump 20 at top section. Since the connection element 10 is not part of the turbomolecular pump 20, it does not function as a rotor of the same. In fact, Conrad describes the connection element 10 as a bridging structure between the shaft 4 and cylindrical elements 5 with multiple openings 11 for facilitating the gas flow from the turbomolecular pump 20 into the friction pump. *See, col. 4, lines 19-27.* Conrad does

not teach that the connection element 10 has the necessary configuration, strength, and spatial relation to the stator of the turbomolecular pump that makes it possible to function as a rotor of a turbomolecular pump. The mere fact that Conrad teaches one embodiment where the connection element 10 is formed by a number of vanes does not mean the connection element 10 can function as a rotor of a turbomolecular pump. For example, because the connection element 10 is located within a gas friction pump, the gas pressure around it may simply be too high and viscous for it to function as a rotor of a turbomolecular pump.

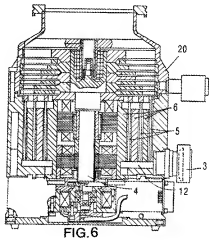

FIG.6

Examiner asserts that there must be an interface component similar to the claimed annular ring in order to connect the cylindrical elements 5 to the connection element 10, even though such interface component is not explicitly suggested by Conrad. *See, the Final Office Action, paragraph 18.* However, Appellant respectfully disagrees.

As shown in FIGs. 1 and 3 of Conrad, the cylindrical elements 5 are directly attached to the vanes of the connection element 10, without any interface component. There is only one sentence (col. 4, lines 23-26) in Conrad that discusses the embodiment where the connection element 10 is formed by a number of vanes. This sentence says nothing about the need or desirability for an interface component between the cylindrical elements 5 and the connection element 10. Given the explicit showing in the drawings that the cylindrical elements 5 are directly attached to vanes of the connection element 10, and the absence of any suggestions or implications that an interface component is

needed or desired, Appellant respectfully contends that Examiner's assertion is conjecture and not supported by the teaching of Conrad.

3. Claims 1, 3-5, 7, 8, and 16 are not anticipated by Conrad under 35 USC 102(b).

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631 (Fed. Cir. 1987).* As discussed above, Conrad fails to teach "the rotor blades of the turbomolecular pumping mechanism are provided with an annular ring, disposed co-axially with the rotor body and positioned between two ends of each of the rotor blades in a radial direction." Thus, Appellant respectfully submits that independent claim 1 is not anticipated by Conrad under 35 USC 102(b). Accordingly, claims 3-5, 7, 8, and 16 that depend from claim 1 and include all the limitations recited therein are not anticipated by Conrad under 35 USC 102(b), either.

B. Examiner errs in rejecting claims 1, 3-5, 7, 8 and 16 under 35 USC 103(a) as being obvious over Conrad.

1. Examiner's proposed modification of Conrad by adding a ring-shaped interface component between the connection element 10 and the cylindrical elements 5 still fails to teach each and every element of the claim 1.

Examiner asserts it would have been obvious for a person skilled in the art to modify Conrad by adding a ring-shaped interface component between the connection element 10 and the cylindrical elements 5. *See, the Final Office Action, paragraph 5.* However, as discussed above, Conrad's connection element 10 is not comparable to the rotor blades of the turbomolecular pumping mechanism of the claimed invention. A rotor

having multiple vanes does not necessarily make it a rotor of a turbomolecular pump. A connection element of a gas friction pump does not become a rotor of a turbomolecular pump, simply because it is made with vanes instead of a punctured plate. The modification proposed by Examiner, assuming proper for the sake of discussion, would provide a connection element of a gas friction pump with an annular ring, but would not provide a rotor of a turbomolecular pumping mechanism with an annular ring. As such, the proposed modification still fails to teach each and every element of the claimed invention.

2. *There is no suggestion or motivation in Conrad to make the proposed modification.*

Appellant acknowledges that it is possible in theory to add a ring-shaped interface component between the connection element 10 and the cylindrical elements 5. However, the fact that a person skilled in the art could have done something does not mean he or she would have actually done it. The mere fact that references can be combined or modified does not render the resultant combination or modification obvious unless the prior art also suggests the desirability of the combination or modification. *In re Mills, 916 F.2d 680 (Fed. Cir. 1990).*

There is no suggestion or motivation in Conrad to add a ring-shaped interface component between the connection element 10 and cylindrical elements 5. As discussed above, FIGs. 1 and 3 of Conrad clearly show that the cylindrical elements 5 are directly connected to the vanes of the connection element 10, without a ring-shaped interface component. There are many configurations to connect them, without a ring-shaped interface component. For example, each of the coaxial cylindrical elements 5 can have a

few prongs attached to a few of the matching vanes of the connection element 10. In another example where an interface component is used, it can take the form of a few discontinuous, discrete protrusions extending from the vanes of the connection element 10 toward the cylindrical elements 5. The protrusions may form a triangle or square, instead of a shape of annular ring. An interface component in a shape of annular ring is just one of many possible designs for attaching the cylindrical elements 5 to the connection element 10. It is not an inherent and unavoidable choice, as Examiner suggests in paragraph 17 of the Final Office Action.

Conrad only provides a one-sentence-long description regarding the connection element 10 with vanes, which reads "[i]n the connection element shown in FIG. 3, the gas discharge structure is formed by vanes 14 extending at an angle to the suction port 2." *See, col. 4, lines 23-26.* Given the thinness of the disclosure, there is no sufficient suggestion in Conrad as to the desirability of the modification proposed by Examiner. Thus, Appellant respectfully submits that it would not have been obvious for a person skilled in the art to make such modification under the established legal precedent.

3. Claims 1, 3-5, 7, 8, and 16 are not obvious over Conrad under 35 USC 103(a).

For the reasons discussed above, it would not have been obvious for a person skilled in the art to modify Conrad by adding an annular-ring-shaped interface component between the cylindrical elements 5 and the connection element 10. Thus, Appellant respectfully submits that independent claim 1 is not obvious over Conrad under 35 USC 103(a). Accordingly, claims 3-5, 7, 8, and 16 that depend from claim 1 and include all the limitations recited therein are not obvious over Conrad under 35 USC 103(a), either.

C. Examiner errs in rejecting claims 9, 18, and 19 under 35 USC 103(a) as being unpatentable over Conrad in view of Stones.

For the reasons discussed above, independent claim 1 is patentable over Conrad under 35 USC 102(b) and 103(a). Accordingly, claims 9, 18, and 19 that depend from claim 1 and include all the limitations recited therein are also patentable over Conrad in view of Stones under 35 USC 103(a).

D. Examiner errs in rejecting claim 10 under 35 USC 103(a) as being unpatentable over Conrad in view of Rourk.

For the reasons discussed above, independent claim 1 is patentable over Conrad under 35 USC 102(b) and 103(a). Accordingly, claim 10 that depends from claim 1 and includes all the limitations recited therein is also patentable over Conrad in view of Rourk under 35 USC 103(a).

E. Examiner errs in rejecting claim 11 under 35 USC 103(a) as being unpatentable over Conrad in view of Schofield.

Appellant believes that the cited patent number of Schofield is misplaced and should have been No. 5,848,873. Clarification is respectfully requested.

For the reasons discussed above, independent claim 1 is patentable over Conrad under 35 USC 102(b) and 103(a). Accordingly, claim 11 that depends from claim 1 and includes all the limitations recited therein is also patentable over Conrad in view of Schofield under 35 USC 103(a).

Appellant respectfully submits that the Examiner is incorrect in rejecting the pending claims, and that all the pending claims are drawn to a novel subject matter, patentably distinguishable over the prior art of record. Accordingly, Appellant respectfully requests that the Appeal be granted and the Examiner reversed.

Respectfully submitted,

By: /Ting-Mao Chao, Reg. No. 60,126/
Ting-Mao Chao
Attorney for Applicant
Registration No. 60,126

Edwards Vacuum, Inc.
Legal Service – Intellectual Property
2041 Mission College Blvd. Suite 260
Santa Clara, CA 95054

TEL: 1-408-496-1177 ext. 2222
FAX: 1-408-496-1188

Customer No.: 71134

VIII. CLAIMS APPENDIX

1. (Previously Presented) A vacuum pumping arrangement comprising:

a turbomolecular pumping mechanism having a rotor, wherein the rotor comprises a rotor body and rotor blades extending radially outwards from the rotor body; and

a molecular drag pumping mechanism connected in series with the turbomolecular pumping mechanism, wherein a rotor of the molecular drag pumping mechanism is affixed to the rotor blades of the turbomolecular pumping mechanism; and

wherein the rotor blades of the turbomolecular pumping mechanism are provided with an annular ring, disposed co-axially with the rotor body and positioned between two ends of each of the rotor blades in a radial direction, to which the rotor of the molecular drag pumping mechanism is fixed.

2. (Cancelled)

3. (Previously Presented) The vacuum pumping arrangement as claimed in claim 1, wherein the turbomolecular pumping mechanism has a plurality of stages and the rotor blades of at least the last stage are provided with the annular ring.

4. (Previously Presented) The vacuum pumping arrangement as claimed in claim 1, wherein the rotor of the molecular drag pumping mechanism is supported approximately half way along the radial length of the rotor blades of the turbomolecular pumping mechanism.

5. (Previously Presented) The vacuum pumping arrangement as claimed in claim 1, wherein the molecular drag pumping mechanism has a plurality of rotors affixed to the rotor blades of the turbomolecular pumping mechanism.

6. (Cancelled)

7. (Previously Presented) The vacuum pumping arrangement as claimed in claim 1, wherein the rotor of the molecular drag pumping mechanism has associated therewith two parallel pumping paths comprising a pumping path radially inward of the rotor and a pumping path radially outward of the rotor.

8. (Previously Presented) The vacuum pumping arrangement as claimed in claim 1, wherein the molecular drag pumping mechanism is of a holweck type.

9. (Previously Presented) The vacuum pumping arrangement as claimed in claim 1, further comprising a second molecular drag pumping mechanism having a rotor, wherein the rotor of the second molecular drag pumping mechanism is supported by a rotor of a regenerative pumping exhausting mechanism.

10. (Previously Presented) The vacuum pumping arrangement as claimed in claim 1, wherein the rotor of the molecular drag pumping mechanism is made from a carbon fiber composite material.

11. (Previously Presented) The vacuum pumping arrangement as claimed in claim 1, wherein the rotor blades of the turbomolecular pumping mechanism are made from aluminum.

12. (Cancelled)

13. (Cancelled)

14. (Cancelled)

15. (Cancelled)

16. (Previously Presented) The vacuum pumping arrangement as claimed in claim 7, wherein the molecular drag pumping mechanism is of a holweck type.

17. (Cancelled)

18. (Previously Presented) The vacuum pumping arrangement as claimed in claim 5, further comprising a second molecular drag pumping mechanism having a rotor, wherein the rotor of the second molecular drag pumping mechanism is supported by the rotor of a regenerative pumping exhausting mechanism.

19. (Previously Presented) The vacuum pumping arrangement as claimed in claim 8, further comprising a second molecular drag pumping mechanism having a rotor, wherein the rotor of the second drag pumping mechanism is supported by the rotor of a regenerative pumping exhausting mechanism.

IX. EVIDENCE APPENDIX

Following references are relied upon by the Examiner in rejecting the claims of the present application, and cited in this Appeal Brief. Copies of the references are separately attached to this Appeal Brief.

1. US Patent No. 5,893,702 to Conrad et al. is relied on by Examiner in the Final Office Action of March 18, 2010.
2. US Patent No. 6,135,709 to Stones is relied on by Examiner in the Final Office Action of March 18, 2010.
3. US Patent No. 4,465,434 to Rourk is relied on by Examiner in the Final Office Action of March 18, 2010.
4. US Patent No. 5,848,873 to Schofield is relied on by Examiner in the Final Office Action of March 18, 2010.

X. RELATED PROCEEDINGS APPENDIX

None